Newsletter of the North American Mycological Association

THE MYCOPHILE

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Fête in the Dairy State: NAMA 2005 at UW–LAX

by Judy Roger

A glorious place for a foray: the banks of the Mississippi

This year's annual foray/meeting had the usual "NAMA curse" of a very dry pre-season—the rains started only a day or so before we arrived, then proceeded to dump on us several mornings. However, quite a few mushrooms managed to struggle into view in time for us to pluck them, caress them, photograph them, and call them by name.

Our magnificent host Tom Volk and his students welcomed us and helped us settle into the dorms at the University of Wisconsin–La Crosse campus on the scenic banks of the Mississippi River. Many of us were met at the airport to be transported into town to campus and, along the way, were treated to a brief tour of La Crosse, shown the best café in town for a tasty deli-style lunch, given a tour of campus to help us get our bearings, then helped to our rooms. If this is an example of young students in biology today, La Crosse can be very proud. They were friendly, helpful throughout the foray, and always ready to assist wherever they were needed.

Chief Mycologist Andy Methven points out characteristics during the Tables Walkaround. Photo courtesy of Coleman McCleneghan.

Even though we had quite a walk diagonally across campus for our meals, they were excellent and offered many healthy choices. College food has changed considerably for the better; these meals were similar to what you find in many good restaurants. The sit-down meals with linens on the tables created a good atmosphere for lingering in conversation. We were happy that the campus was fairly small and on a flat plain as the weather was very hot. As we walked to breakfast, it would sprinkle, then open to a hefty downpour, usually letting up about the time we left for the fungal fields.

Mushroom collecting took some persistence since the weather had been quite dry up until the foray, but even in town at the Hixon Forest Preserve (only two miles from the

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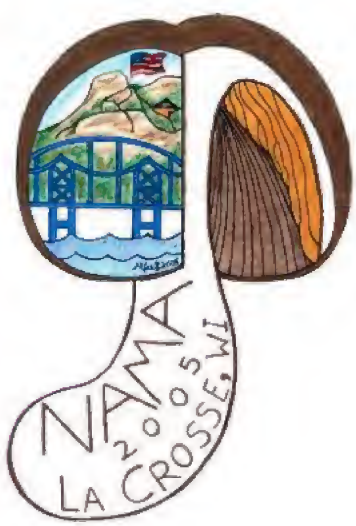

The logo for Foray '05 was created by one of his Tom Volk's students, Maria Lee.

PRESIDENT'S MESSAGE

NAMA '05 was a great success. Thanks again to Tom Volk, his students, other graduate students, lecturers, presenters, foray leaders, and all of the others who pulled off a wonderful foray. The species found and much other information about the foray will be forthcoming in THE MYCOPHILE.

The officers and trustees of NAMA met for a marathon session prior to the foray. We covered a lot of material in a full day, breaking only for lunch and a short afternoon stretch of the legs. If you know any of these people who give so much of their time and energies to NAMA, please thank them for a job well done. Following is a brief summary of just a few of the issues discussed at the trustees meeting.

NAMA is financially stable. The organization realized a profitable year and has maintained assets at a level that should insure continued operations for the foreseeable future. Membership increased slightly, with more new members joining and the number of renewing members also rising.

The trustees voted to continue financing an annual mycology scholarship administered through the Mycological Society of America. In addition, representatives of NAMA and MSA have been talking to each other and are beginning to open doors that we hope will lead to the two organizations working more closely together to advance the science of mycology in this country.

An agreement has been reached with the New York Botanical Gardens for archiving NAMA materials. In addition, NAMA has recently received two large collections of fungal slides, books, and information from individuals; the trustees will utilize them to the best advantage of the membership.

The NAMA Endownment Fund has been established. The earnings from the fund will be used to advance the science of mycology through various avenues available to NAMA. The fund was established by combining undesignated special events funds with the generous donations of the officers and trustees of NAMA, who put over $2,000 personally into the investment. A special thanks goes to Ben Woo, who got the ball rolling with

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Steven and Brooke Behmke of Slinger, Wisconsin, proudly display a large Dairy State puffball. Photo courtesy of Cindy and Steve Sr.

Moving?

Please send your new address, ***two weeks*** before you move, to

Ann Bornstein
NAMA Membership Secretary
336 Lenox Avenue
Oakland, CA 94610-4675
<Membership@namyco.org>

Otherwise—you may not be getting your newsletter for a while. Each issue, several *Mycophiles* are returned as undeliverable because of no forwarding address on file. NAMA is charged ***seventy cents*** for each returned or forwarded newsletter.

NAMA is a 501(c)(3) charitable organization. Contributions to support the scientific and educational activities of the Association are always welcome and may be deductible as allowed by law. Gifts of any amount may be made for special occasions, such as birthdays, anniversaries, and for memorials.

Special categories include
Friend of NAMA: $500–900
Benefactor: $1000–4900
Patron: $5000 and up

Send contributions to
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330 Wildwood Place
Louisville, KY40206-2523
<judithmc@iglou.com>

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Three Exotic Mexican Forays

The Copper Canyon Mushroom Expedition, July 24–31

The Tlaxcala Mushroom Foray, August 28–September 4

The Veracruz Fungi Exploration, October 16–23

For details see the Mar./Apr. '05 issue of THE MYCOPHILE; contact the tour organizers, Erik and Gundi, at gundi@mexmush.com; or visit www.mexmush.com.

Annual Gary Lincoff Mid-Atlantic Mushroom Foray

September 10

For details see the May/June '05 issue of THE MYCOPHILE or contact the WPMC or Dick Dougall at (412) 486-7504 or by email <rsdme@imap.pitt.edu>; or Glenn Carr at (412) 369-0495 or by email <gbrown2carrs@cs.com>.

Annual Priest Lake Foray

September 23–25

For details see the July/Aug. '05 issue of THE MYCOPHILE or contact Doris <dstad@juno.com> at (509) 328-7973 or visit www.spokanemushroomclub.org.

Wildacres Regional NAMA Foray

Wildacres, NC

September 29–October 2

Dr. Orson Miller, Jr., will be Principal Mycologist. Participants at this foray will be limited to 40 persons, double occupancy. There are no private rooms. The cost of the foray is $175 and covers three nights lodging and eight meals beginning with an evening meal on Thursday September 29 and ending with breakfast on Sunday, October 2. Registration form can be found in this issue of THE MYCOPHILE. For additional information contact Allein Stanley at <wildacres@namyco .org>.

Annual Mushroom Conference

Breitenbush Hot Spring Resort, Detroit, Oregon

October 6–9

Our speakers this year are mycologist Dr. Susan Libonati, who will be delighting us with the subjects of mushroom anatomy and human uses of fungi, and Dorothy Beebee, an artist and internationally recognized expert on the subject of dyeing with fungi. Chef Michael Blackwell will present the mushrooms with their best flavors forward, and Hot Springs biologist Paul Kroeger will be our foray mycologist with expertise to share about what's what at the fungi level at Breitenbush. Judy Roger and Maggie Rogers are our local mushroom experts—fountains of information about things mushroom including books about mushrooms, what they are and how to find them! Expert guides will lead the inexperienced in daily forays, and hands-on dyeing and identification workshops will keep you busy back at the resort when you are not soaking in the hot waters or enjoying the delicious organic foods.

The Mushroom Conference at Breitenbush Hot Springs is now posted on their Web site. Sign up right away to take advantage of the early registration discount! Visit www.breitenbush.com/html/events/oct6-9.html to view more information about this relaxing, fun, and educational conference. For answers to questions, contact Patrice Benson at (206) 722-0691.

3rd International Medicinal Mushroom Conference

Port Townsend, Washington

October 12–17

For details see the May/June '05 issue of THE MYCOPHILE or contact Steve at (800) 780 9126 extension 10, or email at <immc@fungi.com>.

SOMA Winter Mushroom Camp

January 14–16, 2006

The Sonoma County Mycological Association (SOMA) invites you to the 9th Annual SOMA Winter Mushroom Camp, Martin Luther King weekend, January 14–16, 2006.

The Camp, a benefit for SOMA, will offer a full schedule of mushroom forays, specimen tables, slideshows, and speaker presentations. The SOMA Culinary Group will prepare wonderful wild mushroom cuisine for all to enjoy.

A variety of classes and workshops in mushroom photography, cooking with wild mushrooms, medicinal mushrooms, mushroom cultivation, papermaking, and fabric dyeing will be offered to camp participants. Additionally, those attending will have several forays, planned and led by experienced and knowledgeable mycology members, to choose from each day.

Lodging. Situated near Occidental, in beautiful Sonoma County, the camp is approximately one hour north of San Francisco. The spacious, modern camp offers shared cabins, which are heated, bright, clean, and airy, set among 225 acres of some of the most gorgeous oak, madrone, tan oak, redwood, and Douglas fir forests in the state.

Registration information. Aug. 15–Nov. 15, 2005: $195. Nov. 15, 2005–Jan. 5, 2006: $225. One-day registration for Sunday, February 16, 2006, is available for a fee of $110. Fees include lodging, meals, and all classes, presentations, and activities. Sunday's fees do not include lodging. To obtain a registration form or for more information, check out our Web site at www.SOMAmushrooms.org or call Rick Meininger, SOMA Winter Camp Co-Director, at (707) 938-4106.

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NAMA WILDACRES REGIONAL FORAY
September 29–Oct. 2, 2005
Wildacres , North Carolina

To register, complete this form and mail with a check for $175, payable to NAMA, to Allein Stanley, 136 Homeplace Drive, Mount Holly NC. For additional information call (704) 827-1939 or email <wildacres@namyco.org>. Persons sharing a room may use the same form.

1. Name _____
❑ Male ❑ Female
Address_____
_____
Phone _____
E-mail _____
I wish to room with _____
_____
Dietary requests_____
_____
Bedding preference: ❑ Double ❑ Single

2. Name _____
❑ Male ❑ Female
Address_____
_____
Phone _____
E-mail _____
I wish to room with _____
_____
Dietary requests_____
_____
Bedding preference: ❑ Double ❑ Single

Participants at this foray will be limited to 40 persons, double occupancy. There are no private rooms. The cost of the foray covers 3 nights lodging and 8 meals beginning with an evening meal on Thursday, Sept. 29, and ending with breakfast on Sunday, October 2.

Liability waiver: By signing below, I release the North American Mycological Association, its officers, and members from any and all liability and loss arising from any accident, injury, or illness which may result from activities of he NAMA regional foray at Wildacres.

Signature #1_____
Date_____

Signature #2 _____
Date _____

Forays and Announcements, continued from page 3

8th International Mycological Congress

Cairns, Australia
August 21–26, 2006

It's not too early to start planning—and saving money—for IMC8. Details are forthcoming; in the meantime check the Web site for periodic updates: www.sapmea.asn.au/imc8.

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Young Adult Amateur Mycologists Needed for Research Project

Amateur mycologists between the ages of 18 and 35 are invited to participate in a research project that will investigate how young people develop interests in hobbies involving wild environments and natural history. Participation involves working with a researcher with the Environmental Socialization Project to create an environmental autobiography. Results should help nature centers and environmental education centers do an even better job of introducing children and youth to natural history subjects. For more details or to volunteer, contact Rob Bixler of Clemson University at <rbixler@clemson.edu> or (864) 656-4849.

Foray 2005, continued from page 1

university), if one looked carefully and walked slowly, a large number of species could be collected: *Coprinus, Psathyrella, Collybia, Amanita, Sarcoscypha, Microstoma, Xylaria*, some inoperculate Ascos, plus umpteen polypore-related genera. (This was only what I saw collected by my companions on a two-hour walk. Much more was found on a later, longer walk in the same area.) Because the rains had started, mosquitoes were out in large, hungry numbers; but that didn't stop us.

Collecting trips were made to several interesting sites that exhibited unique vegetative habitats created by ancient geologic processes due to lack of glaciation during the previous ice age. People were intrigued by the variations in each site. All areas were within a very short drive from campus, making it easy for most to see all sites. Pat Leacock, the Voucher Collection Chair, reported that 325 species were collected by attendees, with five species of truffles found by Roseanne Healy; 55 species of lichens identified by Will-Wolf, Trest, and Nelsen; and numerous myxomycetes that he didn't list in his note.

The largest and most interesting specimen found was *Paragyrodon spaerosporus,* the "Leatherneck Bolete." *Cryphonectria parasitica* and a young *Fistulina hepatica* were also on the tables. Because the rains began so close to the foray, few of the fleshy "charismatic mega fungi" were found, but many members of the Polyporales were well represented.

Those who took the trips to the American chestnut (*Castanea dentata*) forest found quite a number of interesting fungi and had the opportunity to see a somewhat rare native tree that is still surviving in a forest setting. Because most of the American chestnuts across the eastern portion of the country succumbed to the blight *Cryphonectria parasitica*, few people have seen that species of tree. This forest owes its existence to an early settler who planted a few trees, which multiplied to several thousand. They remained free of the blight until about 20 years ago, when it appeared in one tree. Since the first infection, more than one thousand trees have succumbed. Many trees sport "diapers" because they are subjects in a study of inoculating the trees with the attenuated blight organism in the hopes of increasing their resistance. The largest tree has a diameter of more than four feet. They are really magnificent trees, and it is hoped many will remain. Surprising to many, the native tree has a small nut (and frequently more than one nut per husk) in contrast to the nuts we find in the markets during the winter holidays. The nuts in stores are an Asian species and do not have the same texture and sweet flavor as *C. dentata.*

The committee that assembled the classes and programs provided an interesting array without overwhelming us. A partial sampling of the offerings—*Beginner's Foray and Identification Workshop,* with

An American chestnut of record-breaking size. Photo from Tom Volk's Foray Web site.

Michael Beug; *Russulas of the Eastern U.S.*, by Bart Buyck; *Mushroom Anatomy with a Hand Lens,* with Walt Sundberg; to seriousness: *On Being Deadly: the History of Amatoxins;* having a good laugh while learning: *Getting the Jellies Out of a Jam: An Updated Classification of Jelly Fungi,* by Beth Frieders; *Legerdemain in the Fungal Domain: Use and Abuse of Insects by Fungi,* by MYCOPHILE editor, Britt Bunyard; *Spine Tingling Fungi: It's Like Pulling Teeth,* by Sean Westmoreland. Also, Susan Will-Wolf presented a great workshop on taking the mystery out of identifying the local lichens. Her enthusiasm was infectious and helpful in understanding them. Other interesting workshops and classes kept attendees busy when they were not out searching for elusive mushrooms.

This year a large number of names were submitted for NAMA's two awards for teaching and furthering mycology within local clubs and also for mushroomers in general. Dr. Tom Volk received the prestigious Contributions to Amateur Mycology Award for his incredibly popular outreach to people at all levels of interest as well as the public in general. We all know how popular Tom's methods of teaching are and how much he encourages everyone to go beyond what they

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2005 NAMA Award Winners

[*This year's winners were announced at the 2005 Foray Awards Banquet by Trustee Maggie Rogers. Commentary was prepared and submitted by Awards Chair Gary Lincoff.*]

Award for Contributions to Amateur Mycology

"This year's NAMA Award for Contribution to Amateur Mycology winner is known to everyone. He is an active contributor to everyone's foray—including our NAMA Forays. He comes to the forays, identifies mushrooms, helps beginners and experts alike understand what they've been collecting, and gives inspiring and entertaining talks at all these forays. In addition, in case you don't already recognize him by this description, he has a Web site that is to dye for (pun intended), on which it will be hard not to find whatever mushroom you're looking for. His Web site is composed of good science and abundant humor. He has been giving us a Fungus of the Month every month for years, as well as telling us of ways to celebrate our holidays with mushrooms. He is also the tattoo guru of American mycology. You can't miss him at our forays: who else has a tattoo of morel mycelium going up his right arm? Will his left arm get a basidiomycete tattoo so we can say that anyone looking at him can tell their ascus from their basidium? Is there any way that this candidate for NAMA's Award has not contributed in some conspicuous and rewarding fashion? He's long overdue for this Award.

"The winner of NAMA's Award for Contributions to Amateur Mycology for this year, 2005, is Dr. Thomas Volk. "

A standing ovation followed this grand news! As he reached the podium, Maggie added, "Congratulations, Tom! Now if we can get you to a tattoo parlor and find some bare skin, you can be the only NAMA Award winner bearing a tattoo of your award!"

Tom Volk. Photo courtesy of Coleman McCleneghan.

NAMA's Award for Contributions to Amateur Mycology is given annually to a person who has contributed extraordinarily to the advancement of amateur mycology. Its recipients have often extensively conducted workshops, led forays, written or lectured widely about mushrooms and identifying mushrooms, all on a national or international level. Selection is made by a committee consisting of past award winners, and the award includes a plaque and lifetime membership in NAMA.

Nominations for this award should include a description of the accomplishments the nominee has made in the field of amateur mycology. Previous nominees who were not selected to receive the award are still eligible for re-nomination. Nominations for the award should be sent *no later than April 1st* of the year in which the award is to be given.

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The Harry and Elsie Knighton Service Award

"This year's Harry and Elsie Knighton NAMA Service Award featured a vigorous contest among eight candidates nominated by eight mycological societies across North America. The nominating paperwork that came in for these candidates included newspaper articles, articles from mushroom club newsletters, black and white illustrations of mushrooms drawn by the candidates, photographs of the candidates involved in various mycological activities, letters of recommendation, and a nominating letter highlighting the activities in which the candidate has helped the local mycological society the past couple of years. Based just on the quality of these candidates, we have an amazingly energetic and creative membership out there. (And if ever half of the mycological societies in North American nominated a candidate among their ranks, it would be an impossible job to evaluate these nominations!)

"It was very difficult, this year, to choose one winner among these eight nominees. The judges for the Knighton Service Award are composed of the winners of the previous three contests. This year one of the judges withdrew because someone from his club had been nominated, and we brought in the winner from the previous year to take his place.

"This year's winner's name appeared on all three judges' ballots. This year's winner was considered outstanding by these judges and worthy of recognition at this time for the Harry and Elsie Knighton Service Award for 2005.

"This year's winner comes from the Oregon Mycological Society, of Portland, Oregon, and he is Richard Bishop."

Following a rousing round of applause at this announcement, Maggie went on, "If you want a very brief synopsis of what a Knighton Service Award winner should be doing for his local club, lend an ear for two minutes." She then read a "brief synopsis" of Dick's recent contributions:

NAMA Awards, continued from page 6

1. Dick leads ten monthly meetings per year for 40 or so members who bring in specimens for ID. He helps them with identification of their collections.
2. He plans eight meetings or so per year for Intermediate Education Classes, involving microscope use, handouts, and study of groups at an increased level of skill and understanding.
3. Dick leads field trips and is one of the club's most popular field trip leaders.
4. Each fall Dick is involved in Community Outreach and brings together a crew to put up posters and displays, give talks, and identify mushroom for the Mt. Hood Forest Information Center.
5. He coordinates the arrangement and identification of the fresh mushrooms that arrive in collecting boxes for the club's annual Fall Mushroom Show.
6. He is an active member of the OMS Toxicology Committee, one of the most respected in the country.
7. He is an accomplished photographer and has won prizes several times in the NAMA Photography Contest.
8. He is a member of the Pacific Northwest (Mycological) Key Council and specializes in the boletes.
9. He joined the Oregon Mycological Society in 1984 and has served as its President twice.

Maggie concluded, "Dick Bishop is not only a hugely deserving winner of the Harry and Elsie Knighton NAMA Service Award, but he should serve as a model for all future candidates for nomination for this award."

The Harry and Elsie Knighton Service Award was established by the NAMA Board of Trustees to recognize and encourage persons who have distinguished themselves in service to their local clubs. It is named for the Knightons, whose efforts began the North American Mycological Association in 1967.

The annual award consists of a framed certificate, publicity for the winner and club in The Mycophile, a one-year membership in the organization, and registration, housing, and foray fees for the next NAMA Foray. Each year's recipient is selected by the three most recent recipients of the Award.

Every NAMA-affiliated mycological club may nominate one candidate who it feels has performed meritorious service during the current or preceding year. Normally, the President of the NAMA-affiliated club makes the nomination for the club (unless, of course, the President is the nominee). Candidates need not be NAMA members. Four copies of the nomination and supporting materials *must be sent by April 1* of the year in which the award is to be given.

Mushroom
The Journal of Wild Mushrooming

Other magazines urge you to subscribe, but ***we invite you to join friends on what we call "printed forays"!***

For 20 years, *Mushroom the Journal* has provided information of value to those who like to hunt, name, cook, study and photograph wild mushrooms. We've answered —

- How do professionals find "pillowcasefuls" of morels?
- In the future, will you have to pay to pick on public land and still have to contend with bag limits?
- If you discover a new species, can you name it anything you want?
- Should you worry about violence from commercial pickers?
- Can you do more with choice edibles than toss them in a sauté pan with butter?
- Can you grow your own truffles? Train your own truffle hound?
- Can you subscribe to the ***world's best mushroom magazine*** and have your satisfaction guaranteed? (You certainly can guess that answer—and yes, you can also train the dog.)

We're proud of the job we do of reviewing books of interest to the amateur mycologist. Before you buy, you'll know whether you should. Think we're kidding about "joining" rather than "subscribing"? Our Letters column lets you speak out, or contact others to seek that special book or sell that historic mushroom basket.

So join—come aboard and check us out!
www.mushroomthejournal.com

Yes! Send me ❑ ***the next year (4 issues) for $19*** *or*
❑ ***three years (12 issues) for $49*** (Save $8)

Send your check made out to *Mushroom the Journal to* Leon Shernoff, 1511 E. 54th St., Chicago, IL 60615.

Name _____

Address _____

_____

City, State, Zip _____

E-mail address _____

P.S. How did you hear about Mushroom the Journal?

Foray 2005, continued from page 5

think they can learn. He exemplifies the spirit of this award in every way possible. The Harry and Elsie Knighton Service Award went to Dick Bishop of the Oregon Mycological Society for his long years of service to his society. He has been everything one can possibly beo within a club: president, board, teacher of

Roz Lowen instructs on Ascomycete identification.

several levels of knowledge, field trip leader, exhibit organizer, and the list goes on. . . .

The President's Award, give to an individual chosen by the President as someone who exemplifies NAMA's ideals and goals, was presented to Dr. Walt Sundberg for his lifetime years of service to NAMA in so many capacities it is difficult to name them all. His classes and workshops are always filled to overflowing; he is

NAMA 2005 foraygoers, including this year's President's Award winner Walter Sundberg with a self-styled "rain hat."

Judy Roger, NAMA Executive Secretary, proudly displays a tiny but elegant Microstoma floccosa.

Host Mycologist Tom Volk describes a specimen during the Tables Walkaround.

so patient and helpful to everyone he teaches; and he is a very popular speaker.

Next year? How 'bout Alberta, Canada, in William Schweitzer Provincial Park near Jasper? The dates: August 17–20, 2006. The location is near Hinton, Alberta, at a resort called VentureScape Retreat. Then 2007 will be Pipestem, West Virginia, same week in August as 2006.

Photos on this page appear courtesy of Coleman McCleneghan.

Why I Never Met a Fungus I Didn't Like

by Ed Mena

For the last several years I have been collecting samples of basidiomycetes and ascomycetes from all over country. I have been generously assisted by an assortment of people, both professional and amateur mycologists, many who are members of NAMA. One comment that I frequently hear is that they are pleased someone has found a use for the samples that are usually discarded. I am happy to report that this is the prevailing attitude among mycologists throughout the country. (There are some exceptions, but they will go unnamed.)

One problem that has been very difficult to address is trying to give an adequate explanation of why I am doing what I appear to be doing—and keep the answer within the attention span of the questioner. The solution seemed to be to write an article about my activities so people can read it at their own pace (or not at all, if they choose). Various versions of this article have already appeared in several club newsletters on the East Coast and in San Francisco's *Mycena News*. I have received e-mails that it is handed out (and, I hope, read) in introductory mycology classes in a few colleges, and it looks like the folks at NEMF this year will have to sit through a presentation from me.

I am always trying to find ways to combine natural products and biochemistry. Before becoming a fulltime mushroom researcher with a lab at the University of Connecticut at Avery Point, I researched the venom of *Conus* snails (predatory snails from the Philippines), spider venoms, and compounds from fungal cultures (at Washington University in St Louis, University of California at Irvine, and at Pfizer, Inc.). Whoever said "Nature is the world's best chemist" has been proved correct time and time again. But why is there such a variety of chemicals in nature? And why have I decided to look at fungal fruiting bodies as a source of new and useful compounds? I wish I had a short answer, but I don't.

All living organisms produce an extremely varied list of chemicals. These chemicals fall into two very large—and arbitrary—groups. The first types of chemicals are those that are needed by the organisms for their basic cellular functions such as metabolism, energy production, breakdown of damaged molecules and synthesis of new ones. Cells also need the chemical machinery to make proteins, DNA, RNA, and many other complex molecules that are absolutely essential for all life. Producing each of these large molecules is a complicated process that can include 50 or 60 different chemicals and a similar number of enzymes (large proteins). To make these different chemicals and enzymes, the cell requires yet another series of reactions, a list of which could become quite lengthy, depending on the organism. For example, most typical cells, from bacteria to yeast (a fungus!) to mammals, can oxidize sugar (glucose) and produce energy (ATP) in addition to more specialized tasks, such as dining on decaying wood or savoring fresh dung. You soon get the general idea that many chemicals are needed to keep the basic biochemical machinery of a cell operating properly. These chemicals that keep the cell going are referred to as "primary" metabolites.

If there are "primary" metabolites, then there also must be "secondary" metabolites. We hear about this class of compounds usually in association with plants, fungi, bacteria and other "lower" forms of life, such as invertebrates. (I dislike the term "lower form of life," but elaborating here would digress too much.) The term "secondary" was originally given to this class of compounds largely because no "primary" role was known for most of them. They were chemicals that didn't seem to have any essential role for the organism. There was no reason to believe that if the organism or cell did not produce these compounds, it would not continue happily onward. This was especially true if the organism found itself in a monoculture in some scientist's lab. This is still the case with many "secondary" metabolites—that is, scientists studying these organisms in isolation can find no (obvious) function for them. Most researchers now believe that they play a critical role in the organism's life; it's just that frequently the function of these compounds may be difficult to ferret out among other activities that are being studied. For example, moth sexual pheromones are considered secondary metabolites. The individual moth does quite well without them. However, they are vitally important to the survival of the species. Another classic example of a secondary metabolite is the antibiotics produced by some fungi and bacteria. When growing as a sterile monoculture in someone's laboratory, the organism has little use for antibiotics and usually ceases to product them. However, in its natural habitat, their production is not a luxury.

The pheromones and antibiotics are examples of what I believe are the two major functions of all secondary metabolites made by lower life forms: defense and communication. These functions also help to explain another important observation. Most of the compounds classified as secondary metabolites are not synthesized continuously but are made by what could be described as an "on demand" fashion. A more textbook-like term is "inducible compounds." Perhaps one reason for them not to be synthesized continuously is that many of them are extremely complicated chemicals. Any cell that synthesizes complicated molecules such as ivermectin, taxol, and other secondary metabolites is investing a significant portion of its resources into that synthesis; thus, the product of the synthesis must be essential for its survival. If the production of these

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2005 NAMA 35mm Slide Photo Contest Winners

A

C

H

F

G

Judges' Option

Millipede on *Pluteus*
Walt Sturgeon ..... G
Rosemary's Stinky Baby (*Clathrus ruber*)
Ron Pastorino ..... H
Morel Harvest At the Yoder Farm
Dean Abel ..... J

B

Open Division Pictorial

1 *Boletus bicolor*
David Work ..... A

2 *Cortinarius iodes*
David Dennis ..... B

3 *Amanita muscaria*
Michael Beug C

HM *Calostoma cinnabarina*
David Work

HM *Trametes conchifer*
Walt Sturgeon

HM *Craterellus cornucopioides*
Ron Pastorino

HM *Laetiporus sulphureus*
Charles Fonaas

Open Division Documentary

1 *Collybia dryophila*
David Dennis ..... D

2 *Hygrophorus fuligineus*
Noah Siegel ..... E

3 *Daldinia concentrica*
David Dennis ..... F

HM *Isaria* parasitizing beetle larva
Dean Abel

HM *Suillus luteus*
Noah Siegel

HM *Clavariadelphus truncatus*
Walt Sturgeon

E

D

J

Ed Mena on Fungi, continued from page 9

compounds were not carefully regulated, there would be an enormous liability—those individuals that wasted such resources on their unnecessary synthesis would be rapidly squeezed out. So, instead, their production is turned off and on by environmental cues. It could be a communication from another mating type of the same species, contact with a particular food source, or attack by a predator. Some recent results indicate that with fungi, secondary metabolite production peaks at the time of sporulation, a critical time. If we restrict our study to fungi, we are discussing organisms that can't see, smell, hear, or feel. So how do they detect their surroundings? How do they become aware of essential events such as moisture in their surroundings or the presence of friendly and not-so-friendly companions? These events are likely mediated by chemical communications.

Defensive Chemicals

Let's first consider fungal fruiting bodies and their defense. Fungi live in intense environments, surrounded by other fungal types, bacteria, and all manner of predatory soil-inhabiting invertebrates. Chemical warfare among organisms with clearly different agendas is the rule, not the exception. I'm sure that everyone is familiar with the story of the discovery of penicillin. With the benefit of hindsight, it seems obvious that soil microbes would be synthesizing antibacterial compounds. They are literally surrounded by billions and billions of bacteria that are doing their best to find their next meal. Without antibacterial weapons, soil fungi would have a tough and short existence. By now, thousands of antibacterial compounds have been identified from soil microbes, and it's a good bet that all fungi have some type of antibacterial response. So, how do these bacteria that are being slaughtered by antibiotic-producing fungi respond? Fungi may be clever chemists, but so are bacteria. When this warfare was getting started a billion or so years ago, some bacterial enzyme that split proteins modified itself to split an important chemical bond in penicillin, making it harmless to bacteria. The code for the enzyme, penicillinase (also referred to as beta-lactamase), ended up on a piece of DNA called a plasmid. A plasmid can be spread through bacteria populations rapidly and can even be transmitted to different species of bacteria. The result was that the party was over for penicillin-producing fungi; they were back on the defensive. Over the course of an eon or two, and after probably many chemicals were synthesized and found wanting, a fungus hit on the compound now called clavulinic acid. This compound was an inhibitor of the bacterial enzyme penicillinase. With the clavulinic acid in its chemical arsenal, their penicillin was now once again a potent weapon. There are many other examples of chemical warfare and co-evolution combatants.

The full appreciation of this process is also important for the medical treatment of bacterial infections. Initially, few human pathogenic bacteria carried the penicillinase plasmid. These bacteria were concentrating on more important issues, such as how to combat our immune system, and not on penicillin resistance. However, the widespread use of penicillin created strong selection pressure for a pathogen that managed to pick up the penicillinase plasmid from a soil bacterium. This eventually occurred, and the plasmid rapidly spread through pathogenic bacteria, severely impairing the effectiveness of penicillin. Between 1941 and 2002, penicillin resistance in *Staphylococcus aureus* rose from less than 1% to greater than 99%. It took fungi millions of years to come up with clavulinic acid. Luckily, the pharmaceutical industry found a fungus that produced it a lot sooner. Beecham introduced it as Augmentin (clavulinic acid plus amoxicillin, semisynthetic penicillin) in 1981. I think we would be discounting the creativity of bacteria if we did not assume that for every naturally occurring antibacterial, there is a bacterium somewhere that has figured out a way to beat it. Bacterial resistance to antibiotics has been around for a long time; it didn't evolve because of our use of antibiotics. However, our rampant use of antibiotics created a strong selection pressure for pathogenic bacteria that learned new tricks from soil bacteria.

Some compounds from fungi that are used as drugs don't seem to have a ready explanation. For example, the first cholesterol-lowering agent, mevalonin (Lovastatin, from Merck), came from a fungus. This might initially seem odd, because there seems to be little if any reason for a fungus to make this compound (we all know that mushrooms are cholesterol-free!). The secret is that the fungus needs a chemical named ergosterol, which, as it turns out, is very closely related to cholesterol (which means that mevalonin is also an ergosterol-lowering agent). Nearly every cell in a human body needs cholesterol for proper membrane functioning and has the ability to manufacture it. Humans are also fortunate (and sometimes unfortunate) enough to be able to obtain significant amounts of it from dietary sources. All fungi cells need ergosterol and can also make it. If a fungus can't make ergosterol, it dies. It does not have the option of going out and consuming the fungal equivalent of a Big Mac. So if one fungus is able to stop ergosterol production in its neighbors, it ends up with a bigger piece of the pie. This fungus uses its mevalonin-like compound to block its neighbor's ergosterol production (another fungus), and the neighbor dies, so the fungus has fewer competitors for the food supply. Even Lipitor, which everybody on the planet is taking or probably will take, is a derivative of a natural product. Other types of drugs that are natural products are the immune-suppressant drugs, which have been a major factor in the increase in the number of, and the success of, organ transplants. Seventy-eight percent of the antibacterials and 74% of the anticancer compounds are natural products or are

derived from them, and the majority of the compounds in these two therapeutic classes were isolated from fungi. Additional examples could easily develop into an endless and boring list. However, there is another interesting category of molecules produced by fungi and other organisms: communication molecules.

Communication among Fungi

What are communication molecules? The air we breathe, the water in a lake, and the soil and leaf litter are highways through which all sorts of communication molecules course. We humans are challenged, to say the least, at detecting all but a scant minority of these chemicals. Many species of insects use them to advertise themselves to mates. Plants attract (or repel) insects with chemicals. Various species of animals announce their presence with communication molecules. Take your pet dog for a walk and witness first-hand the signs of an olfactory world from which we are excluded. The lives of millions of animals are synchronized by chemical signals. I'm sure that many of you have seen the remarkable scenes of millions of coral spawning on the same night, from one of David Attenborough's shows from *Life on Earth*. I can't resist one more example, that of the stink horns, which we have the (mis)fortune to detect, as do many insects. Clearly, the chemical signal emanating from the stinkhorn has a very different meaning to you and me compared to the many species of insects encircling its tip.

We live in a sea of chemicals. I heard an analogy once that I've become very fond of: Communications chemicals can be looked at like postage stamps. You put a stamp on a letter or package to communicate something to the addressee. The stamp insures that the message will be received but says nothing about the message or the reaction of the addressee. Communication molecules also insure that a message will transmitted; the exact meaning of the message will depend on the "sender" and "recipient." Another interesting feature of communication molecules is that once Mother Nature found a chemical that could be used for communication purposes, she stuck with it. Similar classes of molecules are used throughout a wide phylogenic range. Communication chemicals can act to send a message from one part of an organism to another (e.g., hormones) or they can send communications to organisms of the same species (pheromones) or to different species (stinkhorns, flowers say "come here," a skunk's smell says "go away," etc).

Since we are talking about mushrooms, what are some things likely to be mediated by communication chemicals? Let's start at the beginning. A spore responds to certain chemical cues to germinate. It may need to know if it has landed on a suitable substrate. These mycelia respond to other mycelia of the correct mating types of the same species to form diploid mycelia organisms. The growing mycelia need to be able to detect and utilize proper nutrients. Additionally, the mycorrhizal species need to colonize (or be colonized by) the appropriate type of tree root for survival and growth. The selectivity of many types of mushrooms has always amazed me. How does *Suillus granulatus* tell the difference between a pine and maple tree? How do the many other mycorrhizal species recognize their hosts? However, also consider also the selectivity of the wood rot polypores. *Piptoporus betulinus* almost always colonizes dead birches. It is rarely found on other species of trees. What signal or signals allow this fungus to selectively grow on this wood? Many species are selective for hardwoods or conifers. When we speak colloquially about these interactions, we make statements like, "They are attracted to dead birch trees," or "*Suillus granulatus* prefers to grow in association with pine." Statements like these seem to give decision-making qualities to organisms that consist of a very limited number of cell types. While they do make a "decision," in a manner of speaking, it is their responses to the various chemicals that they encounter—either positively, negatively, or both—that underlies this apparent decision. These chemicals interact with cell surface or intracellular receptors and induce metabolic changes in the fungus. As I mentioned above, Mother Nature is very fond of the communication systems that fungi developed a billion or so years ago. Many of them have been refined and elaborated upon more as eukaryotic systems increased in complexity. Once evolution found some molecules that were good "postage stamps" and some receptors that were good "mailboxes," it stuck with them and refined them over an eon or two. The result is that many chemicals that are used by higher organisms have their "roots" in fungal metabolism. In fact, recent phylogenetic analysis has shown that the fungal kingdom is part of the terminal radiation of the eukaryotic groups (sometimes eloquently referred to as "the great eukaryotic radiation"). This is assumed to have occurred one billion years ago when prokaryotes and eukaryotes separated (my calendar doesn't go back that far). There is evidence that fungi are more closely related to animals than to plants. The prevailing opinion is that plants diverged from the lineage that then went on to give rise to animals and fungi.

Mammals, of course, have many more pressing communication needs than fungi. In the central nervous system, at least 40 to 50 chemical transmitters have been identified. In the immune system, many types of communications proteins, known as cytokines, have been discovered. These are two broad examples of mammalian communications molecules. What is also true with higher organisms is that the type of message that a molecule sends depends on the receptor that the cell has. An organism may have many different types of receptors for chemicals and the message that a cell receives depends on the receptors on that cell. For example, compounds that interact with mammalian serotonin receptors have been isolated from a fungus.

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The introduction of Prozac has made many of us experts in neuropharmacology, and we all know about serotonin's involvement in mood and depression. There are several types of serotonin receptors in our central nervous and others throughout our body. Serotonin and/or its receptor are apparently also involved in some aspect of fungal communication and may have been used as a communication molecule long before people realized that they were depressed. The cholinergic system provides another example. At one time, before the cloning of receptors became commonplace, there were two types of mammalian cholinergic receptors: nicotinic and muscarinic. The nicotinic receptors were activated by nicotinic acid from tobacco, and the muscarinic receptors were activated by muscarine, from *Amanita muscaria*. *Amanita muscaria* is a particularly rich source of a variety of mammalian communication compounds. It also contains muscimol, which activates mammalian inhibitory transmitter receptors for gamma-amino-butyric acid, and ibotenic acid, which stimulates a mammalian excitatory receptor for L-glutamic acid and is a potent neurotoxin. While these chemicals act at mammalian neurotransmitter receptors, in the case of *A. muscaria* they are probably defensive chemicals. Because of their immediate action, muscaria chemicals would probably persuade potential predators to dine somewhere else. The predators may include mammalians, insects, soil nematodes, and other fungi. We should resist the egocentric notion that these chemicals are directed at our species. As I mentioned above, when nature finds a way to do something well, it usually sticks to it. Fungi synthesize chemicals that act as cytokines, compounds that mimic various peptide transmitters and gut hormones; they produce compounds that release insulin from mammalian cells. No one believes that fungi had *Homo sapiens* in mind when these chemicals were first synthesized.

The take-home message from all of the above is that many receptors and metabolic systems used by fungi overlap with those used by more complex organisms (I'm still resisting using the term "higher"). As a result, there are thousands and thousands of chemicals synthesized by fungus for their own purposes that will also affect mammalian systems, some for better and others for worse. I'm trying to find the "better" ones. Other questions that I often hear are 1) "Exactly what do you do with these mushrooms?" 2) "What kind of compounds are you looking for?" and 3) "So-and-so fungus is already known to be a good treatment for disease/disorder X; why don't you find out what's in it?" Once again, there are no short answers to these questions. I am trying to tackle them in my next installment. Stay tuned!

Ed Mena can be reached at <e.mena@uconn.edu> or eemena@aol.com. —Ed.

How mice help mushrooms grow

by Arturo Estrada Torres

When we look at how forests develop and grow in both cold and warm areas of the world, we almost never think about what factors actually help in that development. Perhaps we think that all that is required is water, salt, minerals, and some light. Generally, we tend to think that plants are quite independent of other life forms. It seems that isn't the case, however. Forests in the northern hemisphere tend to be populated with pines, firs, beech trees, and oaks, while eucalyptus and other tropical trees are found in the southern hemisphere. We now know that the roots of all of these trees have formed associations with various mushrooms, which technically are called ectomycorrhizal associations.

The mushrooms involved in these associations form reproductive structures, part of the fruiting mushrooms we see and collect in our forests during rainy season. Many of these mushrooms are edible, such as boletes and *Amanita caesaria.* Others are poisonous, such as the *Amanita muscaria,* known as the "fly agaric." In all cases, though, these mushrooms play an important role in the maintenance of our forests.

The type of ectomycorrhizal association I've been talking about is mutual: both organisms involved receive benefits. The tree gives mushrooms the carbohydrates and vitamins they need for their development, while the mushrooms provide the tree with water, salt, minerals, and antibiotics that help prevent damage, as well as hormones that help them grow better.

Mushrooms reproduce through spore dispersal, and many mushroom species depend on the wind for this dispersal. There are, however, some mushroom groups that develop their reproductive structures under the ground. These mushrooms cannot disperse their spores through the air and need animals to do the job for them. Such animals need to uncover the mushrooms, eat them, and pass them through their digestive tracts. Once deposited as the animal's feces, the spores are liberated and are ready to germinate. Bears, deer, rabbits, pigs, and mice are just some of the animals that eat a lot of mushrooms as part of their diet because they are rich in nutrients.

But is there also a relationship between animals and mushrooms that do not grow underground? The answer almost certainly is yes, because of the great abundance of mushrooms that grow in our forests and are a sure source of food for the animals that live there. To verify this, we chose three different environments in La Malinche National Park [near Puebla, Mexico], where we studied mushrooms for evidence of animals eating them. As well, we collected the droppings of rodents in the same locations to see if their

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***Die Pilzflora des Ulmer Raumes* (*Fungus Flora of the Ulm Area*)** by Manfred Enderle. 2004. 521 pp.

M. Enderle

Manfred Enderle founded the Study Group for Mycology of Ulm in 1976 and for over ten years has been a member of the Editorial Team for *Zeitshcrift für Mykologie* (*Journal of Mycology*). He has published over 100 mycological papers and has participated in describing 18 fungi new to science.

This beautifully prepared hardcover book is clearly a labor of love. It lists 2,823 taxa, including the slime molds (94) and (mostly) macrofungi that have been found in the Ulm area. This area is precisely defined as the 16 Messtischblätter (topographical map quadrants) that are centered upon Ulm. Each quadrant is 12×11 km, so the total area is 48×44 km (29.8×26.9 miles, the area of about thirty 5×5-mile towns in the prairie regions of Wisconsin). Ulm is on the Donau (Danube) River in southern Germany, just inside Baden-Württemberg, on the border with Bayern (Bavaria).

The book includes a brief introduction to fungi and to the area, 19 excellent photos of various habitats in the area, and a separate section at the end showing the 50 most frequent edible and poisonous mushrooms, followed by 20 pages of pictures of the many European mycologists who have visited Ulm. The body of the book consists of a listing of the taxa, arranged in systematic botanical order down to family, with the finder and quadrant listed for the less usual ones.

Because no descriptions of any botanical groupings are given, and both genera and species are both arranged in alphabetical order within families, this book, like its contemporaries, makes no effort to assist the reader in learning the principles of mushroom classification. The color photos are absolutely outstanding; mushrooms shown in their habitat and often with caps are turned over or sections made to give a good impression of what they look like from more than one angle. For someone who has some books on mushrooms, the illustrations are far more valuable than their number (several hundred) would suggest, because they have clearly been chosen with very different criteria from those in the usual mushroom books that illustrate a few hundred species. For example, fifty-four taxa of *Lactarius* are listed; but only three frequent poisonous, one frequent edible, and one less frequent one (*L. fulvissimius*) are illustrated. Great attention is paid to the dark-spored gilled mushrooms that are usually ignored as much as possible in popular manuals. For example, 30 *Psathyrella,* 23 *Inocybe,* 16 *Conocybe,* and 10 *Hebeloma* taxa are shown in beautiful color photos, belying their usual dismissal by English-speakers as "LBMs." Most species are not described in this book, although references to descriptions in technical papers, often by the author, are given for the less common species.

In some cases, detailed descriptions and occasionally drawings of microscopy are included. I have not been able to discern what the criteria are for describing taxa fully, but certainly only the less usual species have been selected. Almost alone in the ascomycetes, a remarkably full treatment of *Hypoxylon* is given, with illustrations of technical terms, spore drawings of 21 species, and color illustrations of eight. If you are not completely put off by a German text, this beautiful book is a real bargain for anyone interested in fungi; it would cost four times as much at a bookstore.

—Steve Nelsen, Madison, WI

[To order, visit the Web site www.manfred-enderle.de/pilzbuch.htm.]

Black Mold: Your Health and Your Home, by Richard F. Progovitz. Cleveland, NY: Forager Press, 2003. ISBN 0-9743943-9-4. 199 pp. $16.95

This small book is presented in five parts: I. Introduction to Molds, II. Mold Health Issues, III. Molds and the Home, IV. Mold Remediation Issues, and V. Wrap-Up and Resources.

The opening Summary begins with "Growing concerns over indoor air quality combined with media reports about several high profile mold infestations have alerted the public to the potential health risks posed by toxic Black Molds . . . This book proposes to separate hyperbole from the truth regarding indoor mold toxicity issues and to demystify the abundance of molds we encounter in our daily lives. . . ." The "Summary" ends, "The bottom line about indoor mold colonies is that it is better to be safe than sorry. This book will shed light on the dangers of molds and inform the reader what to do if mold is found."

Richard Progovitz is an active and avid mushroom hunter who is also a certified mold inspector and contractor. This leads to an internal conflict in his book. On the one hand he is attempting to educate readers about a wide range of molds and on the other hand he is selling the need to hire contractors to inspect for and remediate mold in homes.

His history of molds leads directly into a section presenting "the latest standards, guidelines and practices that many mold experts, convinced that 'no indoor mold is good mold,' feel are needed in the real estate industry." The amount and complexity of testing that is propounded in this section would consume many thousands of dollars paid directly by the owner or indirectly by greatly increased insurance

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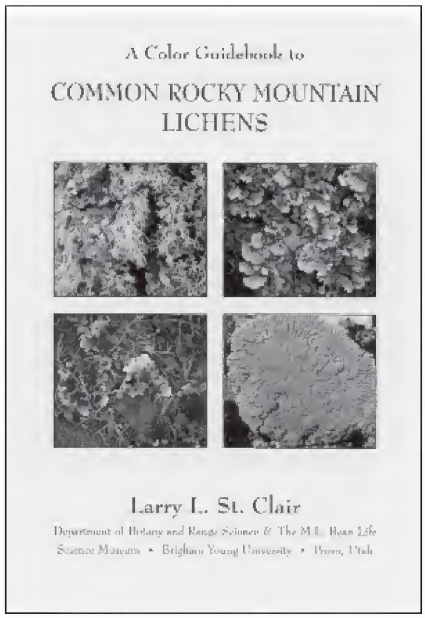
premiums. This section should have been included not in the introduction to molds, but in Part VI, and the reader should have been clearly informed as to when the seriousness of a mold problem would merit such an expense.

Meanwhile, in his description of the fungi, Progovitz seems to consider all fungi as molds, and he describes not only common molds found in buildings but a wide range of other fungi found elsewhere in nature. In raising fears of molds that eat gasoline, molds that can make hay unfit for animals, molds that can ruin grain and yeast, and fungi that live on and in humans, he loses his focus on the problem of molds in homes. His treatise on "Enemies of Mold" and mold spores at the end of section two would fit better as part of the remediation chapter as it would reduce both duplication and confusion on the part of the reader as to what to be worried about.

Like much of the book, Part II, "Mold Health Issues," should focus on issues of mold in the home. There are simply too many disconnected points raised in this section. Part III, "Molds and the Home," has many good and useful points. Again it raises fears about everything that we do to bring spores into a home with too little focus on when and why the spores are likely to pose a problem or which spores are likely to be the most worrisome. Part Four, "Mold Remediation Issues," contains many useful procedures to follow but does not give the reader enough guidance on when it is or is not necessary to bring in inspectors and start spending thousands of dollars on testing, protocol development and remediation. The book does too much to encourage the reader to spend a fortune trying to be safe rather than sorry and too little to separate hyperbole from the truth regarding indoor mold toxicity.

—Michael W. Beug, Husum, WA

A Color Guidebook to Common Rocky Mountain Lichens, by Larry L. St. Clair. Provo, UT: M. L. Bean Life Science Museum and the U.S. Forest Service, San Juan National Forest, 1999. 242 pp; ISBN 0-8425-2454-1.



Until the 1970s, mushroom-hunters wanting to determine the names of their finds had few good resources to help them. Available guides were broad in scope and light on color illustrations. Things changed with the publication of books like *Mushrooms of North America* by Orson Miller, the *Audubon Society Field Guide to North American Mushrooms* by Gary Lincoff, and *Mushrooms Demystified* by David Arora. Now, several fine guides are available, and important regional works, such as Bill Roody's *Mushrooms of West Virginia and the Central Appalachians,* are beginning to appear. Although it has taken longer for the publication flow to start, good color guides to lichens are becoming increasingly available so that, in many parts of North America, it is now possible to identify a substantial number of the common species and many of the less common ones as well. This guide, by BYU Professor of Botany Larry St. Clair, provides another handy resource for hard-core licheneers as well as mushroom hunters with a desire to expand their fungal horizons.

The focus area for the book includes the Rockies south into the Great Basin, Colorado Plateau, and the "sky islands" of southeastern Arizona and southwestern New Mexico. The content is typical for a field guide. The Introduction explains what lichens are (composite systems, or symbioses, consisting of a fungus and a photosynthetic green alga or blue-green bacterium), the basics of their structure, how they grow and reproduce, the distinctive chemicals that many of them produce, and their ecological occurrence.

Because many lichens are quite sensitive to air pollutants such as sulfur dioxide, they can be used as biomonitors (biological monitors) of air quality. For instance, if sensitive species are present in a given area, one can conclude that the air quality there must be good. St. Clair includes an extensive discussion of sensitivity in terms of effects on morphology, physiology, growth, reproduction, and general ecology of lichens, and concludes this section with a discussion of the methods used to evaluate air pollutant impact on lichens.

The remainder of the introductory material deals with the classification of lichens, the tools needed to identify them, and how to collect and preserve specimens for identification. All of this introductory material is presented clearly and concisely. The lichens follow, and the book concludes with suggestions for further reading, a glossary, and a list of references cited. There is no index, but the lichens are presented alphabetically so the lack of one is not an issue.

The treatment of the lichens themselves begins with a set of keys to growth types and genera. Further keys to species are included with many of the genus treatments. The key leads are brief, focusing on the more critical features. In many cases their use requires access to a microscope (size and shape of spores, number of spores per ascus,

etc.), ultraviolet lamp, or chemicals such as household bleach, potassium hydroxide, and Melzer's reagent or similar iodine solution. Brief descriptions of each genus are included, followed by a key to species in cases where more than one exist in the area. Not all of the species in the keys are described. For those that are, the descriptions include morphological characteristics, chemistry, substrate/habitat, and air pollution sensitivity. There are no general comments. A color photo is included for each described species. These photos are of very good quality, especially those provided by Stephen and the late Sylvia Sharnoff. They will allow the casual user to tentatively identify many of the species without resorting to the keys and chemicals.

From a user's perspective, I would have found the following features helpful:

- Comments pointing out important or interesting features about each species and, especially, how to tell it from related or similar-looking ones. Most pages have space where such comments could be added without increasing the length of the book.
- An indication of size of the thallus (body of the lichen). Many of the photos are cropped closely and contain little information (leaves, twigs, etc.) on relative size.
- Information on the species ranges beyond the Rockies. This would allow the book to be more useful outside its focus area.
- In cases where a photo includes more than one species, an indication of which one is the species being described and what the names of the others are.
- Printing the book on glossy paper. The clarity of the photos would be greatly increased. Although this probably would increase the price, I would be willing to pay extra.

While these things would have improved the book, it still will be quite useful and, at $19.95, is an excellent buy. I recommend it. It will provide an interesting diversion

Larry L. St. Clair

for those times when the fleshy fungi are in hiding. But wait, there's more! Through the generosity of the author, earnings from the book's sale go to a good cause—an endowment fund for support of the lichen herbarium in the ML Bean Life Science Museum at BYU. As science and natural history funding becomes less and less available across the U.S., under-appreciated organisms like lichens and mushrooms need all the help they can get.

—Steve Trudell
Seattle, WA

[This book can be ordered from the publisher. For information, telephone (801) 378-5052.]

Hebeloma radiculosum and moles

by Steve Nelson

I met Prof. Naohiko Sagara, who has "Professor of Mycology and Life Web" on his business card, at Kyoto University (introduced, as usual, by my Chemistry colleague, Ken'ichi Takeuchi). His specialty is the study of "fungi that sporulate or fruit restrictedly in forest sites where decomposition of urine, feces or dead bodies (cadavers) has occurred."

He lists *Rhopalomyces*, *Amblyosporium*, *Ascobolus*, *Tephrocybe*, *Peziza*, *Coprinus*, *Crucispora*, and *Humaria* species which appear early in the succession, and *Hebeloma vinosophyllum*, *H. spoliatum*, *H. radiculosum,* and an undescribed species; *Lactarius chrysorrheus*; *Laccaria bicolor*, *L. amethystina* and an undescribed species; *Lepista nuda*, *Suillus luteus* and *S. bovinus*, and a *Mitrula* spp. as appearing late in the cycle. He has shown that regular successions (covering at least three years), can also be stimulated by burying urea, aqueous ammonia solution, or other compounds that decompose to ammonia in the woods. Looking at such successions would seem to be an interesting thing to try in the U.S., too.

This work is described in *Can. J. Bot. 73* (Suppl. 1) S1423–33 (1995). Sagara has discovered that *Hebeloma radiculosum* (when identified correctly) apparently only grows near Kyoto on the latrine areas of mole dens. When you find the mushroom, you have found a mole den and can dig down and find the moles (or at least where they were; Sagara said it takes him about three days to excavate a mole den). He has also published on the moles, about which little was known because their dens are about a yard underground and several from the entrance, so they are difficult to locate otherwise. He was pleased that I had seen his plea for people to tell him when they find *H. radiculosum* (published in *Mycology* magazine in the fall issue of 1995). He had had only one response by February of 1996 but was going off to Sweden that summer (at his own expense) to see how closely related the mole species, whose den he was sure he could locate from the site where the mushroom was found, would be to the one he had been studying in the hills surrounding Kyoto. He showed me over a dozen of the nests he had found this way, stored in filing cabinets near his office.

Prof. Sagara has an exceptionally interesting booklet for school children with lovely drawings and text in English and Japanese emphasizing the ecology of fungi.

[This article was originally printed without illustrations in the *Wisconsin Mycological Society Newsletter* (14:4, Dec. 1997). It is reprinted here by permission of the author. —Ed.]

Mice and Mushrooms,
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feces contained any evidence that they had been eating mushrooms.

Why rodents? Rats, mice and squirrels comprise a group of mammals that are well represented in the forests of La Malinche. Generally, they are considered a nuisance because, not only do they eat cultivated plants such as corn, they also eat a lot of the seeds of interesting forest species, inhibiting new growth. Many of these animals tend to store much of the food they gather in their burrows and later abandon it.

After a year of work, we found that practically all the mushroom species we collected in our study sites showed at least some evidence of rodent bites. Often, their tiny teeth marks were clearly visible. We trapped ten different rodent species, most of which had some mushroom spores or other fungal material in their feces, clearly showing that rats and mice eat mushrooms as part of their diet.

What are the implications? As in other parts of the world, animals, specifically rodents, play an important role in the reproduction of mushrooms, especially those whose reproductive structures are under the ground. Even more important, these animals also eat mushrooms that do not grow under ground, providing another means of spore dispersion, one even more powerful than the wind, and one that assures they'll easily find a host to grow on. In this way, rodents are an important element in the forest, connected to all the others and forming a tri-partite association that plays an important role in the functioning of our ecosystems.

[Arturo Estrada Torres is the President of the club Myco Aficionados of Mexico. This article was adapted from a talk given at the February 19, 2005, at a meeting of MAM in Tlaxcala, Mexico. —Ed.]

POETRY

What to Do with Mushrooms

You can cook them up in batter
in an antique frying pan.

You can make them into gravy
to pour over a flan.

You can stuff them fat with spinach
or chop them into dip.

You can pickle them and cream them,
to tantalize the lip.

You can stir them into chowder
or curry them with rice.

You can mix them up with veggies;
in a quiche they're very nice.

But one thing I will balk at
even for fashion's sake

I will refuse any time I'm offered
a piece of mushroom cake.

—Amy Belding Brown

[Amy Belding Brown is a published poet and the author of a historical novel, *Mr. Emerson's Wife,* published recently by St. Martin's Press. —Ed.]

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Errata

In the July/August 2005 issue of THE MYCOPHILE the photocredits were omitted from the feature story on corn smut, by Else Vellinga.

The first photo on page 10, of *Ustilago cynodontis*, was courtesy of the author. The remaining photos, all on page 10 and all of *Ustilago maydis*, were courtesy of Gerald Pataky, a corn pathologist at the University of Illinois.

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On page 19 of the July/August 2005 issue of THE MYCOPHILE contributor Steve Nelsen's name was misspelled and he is, in fact, a professor in the Chemistry Department (not Biochemistry) at the University of Wisconsin–Madison.

President's Message,
continued from page 2

an extremely generous donation, challenging the others to match it.

McIlvainea returns. An issue should be forthcoming within a few months. Anyone with articles to contribute to the journal should contact Britt Bunyard.

Locations for NAMA national forays for 2006 and 2007 were announced. They will be in Alberta, Canada, and Pipestem Park, WV, respectively. Much more information will be forthcoming on these locations. Any club interested in hosting a NAMA foray should contact Allein Stanley or Jack Greene. Anyone out there in the southwest interested?

Much more information about the foray itself will be reported in other articles and issues, I'm sure. If you've never attended a national foray, you should give it a try. As Britt stated to me the other day, it's always amazing how much like a family reunion the forays are. The mushrooms, programs, and workshops are a wonderful side item to getting together with old and new friends. See you in the woods. —*Ike*

Flossie at an MMHC Spring Morel Weekend in the 1990s Photo courtesy of Sister Marie A. Kopin

In Memoriam: Florence Hoseney, 1917–2005

Florence Hoseney died April 25 at 87. Her daughter Laura reported that her mother was joking with nurses almost to the moment she died.

Few Michigan Mushroom Hunters knew that as a student at the University of Michigan, Flossie was Ann Arbor City Champion Speed Skater. She was known to many of us through her creative hats with sprouting fungi and clever drawings. She drew one of our club logos, which shows a pointer dog pointing out mushrooms to a collector.

Flossie worked as a mushroom gofer/collector for Alexander Smith for several years, and she knew of many "secret spots" all over southeast Michigan. She painted a picture of Alexander Smith that hangs in the UM Herbarium. In the picture Alex is standing in the foreground of an area where people are picking mushrooms. One of the pickers is a self-portrait of Flossie in her usual collecting outfit.

There are at least two boletes named after her as "hosenii." Flossie delighted in her "find of the day." She was a person who found mycology gave life purpose and pleasure.

—Adapted from Peter Holmes and the *Ann Arbor News*

CULINARY CORNER

As a result of the article on corn smut by Else Vellinga in the last issue of THE MYCOPHILE, I received a number of comments about the fungus. Many queries involved its edibility. So, the featured ingredient this month is . . . huitlacoche. Corn smut. Mexican corn truffle fungus. Call it what you will; just don't pooh-pooh it based on its appearance. It's actually very tasty! (Although the ancient Mesoamericans knew this, and contemporary Mexicans still do, it's taken a while for many of us north of the border to catch on.)

First things first: seek out a field of sweet corn. Your backyard garden may suffice, especially in droughty years. Don't bother checking field corn, as it's all resistant these days. The fungus can erupt from any part of the plant, but you will want to find ears with it emerging from the top. Harvest the fungus when large and grey but still firm. (The Mexicans prefer not to let it get so far along so as to release teliospores.) But you mustn't pick it too early, as the flavor will be much less pronounced. You can simply pluck it from the ear or slice it—along with all the corn kernels—and fry together. By the way, the preferred method is lightly sautéing. Then you can add it to any dish.

Mexicans make salsas, soups, even ice cream (no kidding) from it. My favorite preparation, and the best for a first try, is to sauté it and place it onto a quesadilla (which is a corn—not white flour—tortilla, grilled on one side for a few seconds, then turned and immediately topped with grated cheese). Once the cheese is melted (after only a few seconds), add your huitlacoche and fold the quesadilla over. Augment with a little of your favorite hot sauce if desired. It's excellent!

To prepare neophytes for this fungal treasure, I tell them to expect flavors of sweet corn (even if none is included with the fungus), mushrooms (like *Agaricus*), and hints of chocolate, especially if the teliospores are beginning to release. Although you could find it in Mexican grocery stores, don't bother to buy canned huitlacoche; it's insipid at best, and the texture is awful.

Huitlacoche, yum! Photo courtesy of Gerald Pataky

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THE MYCOPHILE

Mushroom of the Month: Laetiporus sulfureus

This photo of Laetiporus sulfureus won Honorable Mention in the Annual Slide Contest at this year's Annual Foray in La Crosse, Wisconsin. It was taken by the President of the Wisconsin Mycological Society, Charles Fonaas.